

WHAT IS CLAIMED IS:

1. A sound absorbing article, comprising:

(i) a material which is pervious to air, and which is characterized by proximal and distal surfaces with respect to a sound source, an internal structure, and a specific weight; and

(ii) a coating which adheres to said surfaces and internal structure, thus increasing said specific weight by a predetermined factor.

10           2.       The sound absorbing article of claim 1, wherein said material is a fibrous material.

3. The sound absorbing article of claim 2, wherein said fibrous material is formed of natural fibers.

4. The sound absorbing article of claim 2, wherein said fibrous material is formed of natural fibers, selected from the group consisting of wool, linen, cotton, canvas, cannabis, reed, weed, straw, stalks, seaweed, and a blend thereof.

20           5.       The sound absorbing article of claim 2, wherein said fibrous material  
is formed of fibers derived from cellular materials.

6. The sound absorbing article of claim 2, wherein said fibrous material is formed of fibers derived from cellular materials selected from the group consisting of Rayon, Viscosa, and a blend thereof.

7. The sound absorbing article of claim 2, wherein said fibrous material is formed of fibers derived from cellular materials, selected from the group consisting of recycled paper, recycled organic waste, recycled cellular fiber, and mixtures thereof.

8. The sound absorbing article of claim 2, wherein said fibrous material is formed of polymeric fibers.

9. The sound absorbing article of claim 2, wherein said fibrous material  
5 is formed of polymeric fibers, selected from the group consisting Polyethylene, Polypropylene, Nylon, Polyester, Kevlar®, Nomex®, Polyacrylonitrile, Polyurethane, another known synthetic polymeric fiber, and a blend thereof.

10. The sound absorbing article of claim 2, wherein said fibrous material  
10 is formed as a blend of fibers selected from the group consisting of natural fibers, fiber derived from cellular materials, and polymeric fibers.

11. The sound absorbing article of claim 2, wherein said fibrous material  
15 is a polyester fiber.

12. The sound absorbing article of claim 2, wherein said fibrous material  
is fire-proof polymeric fibers.

13. The sound absorbing article of claim 2, wherein said fibrous material  
20 is formed of polymeric fibers selected from the group consisting of Nomex® - Kevlar® other Aramids, and a blend thereof.

14. The sound absorbing article of claim 2, wherein said fibrous material  
25 is selected from the group consisting of fiberglass, mineral wool, refractory ceramic fibers, and a blend thereof.

15. The sound absorbing article of claim 2, wherein said fibrous material  
is nonwoven.

16. The sound absorbing article of claim 2, wherein said fibrous material  
30 is nonwoven polyester.

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17. The sound absorbing article of claim 1, wherein said material is a foam.

5 18. The sound absorbing article of claim 1, wherein said material is between 10 and 100 mm thick.

10 19. The sound absorbing article of claim 1, wherein said material is between 2.0 and 10 mm thick.

20. The sound absorbing article of claim 1, wherein said material is between 1.0 and 2.0 mm thick.

15 21. The sound absorbing article of claim 1, wherein said material is between 0.4 and 1.0 mm thick.

22. The sound absorbing article of claim 1, wherein said coating comprises a natural resin.

20 23. The sound absorbing article of claim 1, wherein said coating comprises a chemically modified natural resin.

24. The sound absorbing article of claim 1, wherein said coating comprises a synthetic resin.

25 25. The sound absorbing article of claim 1, wherein said coating comprises a polymeric resin.

30 26. The sound absorbing article of claim 1, wherein said coating comprises an acrylic resin.

27. The sound absorbing article of claim 1, wherein said coating comprises a flame-retardant acrylic resin.

28. The sound absorbing article of claim 1, wherein said coating  
5 comprises a silicate compound.

29. The sound absorbing article of claim 1, wherein said coating comprises a mixture of silicate compounds.

10 30. The sound absorbing article of claim 1, wherein said coating comprises water glass.

31. The sound absorbing article of claim 1 and further comprising a flame-retardant agent mixed into a liquid adhesive that forms said coating.  
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32. The sound absorbing article of claim 31, wherein said flame-retardant agent is selected from the group consisting of alumina trihydrate, zinc borate, hexabromocyclododecane, decabromodiphenyl oxide, magnesium hydroxide, ammonium polyphosphates, phosphoric acid, and tetrakis hydroxymethyl  
20 phosphonium chloride.

33. The sound absorbing article of claim 31, wherein said flame-retardant agent is water soluble.

25 34. The sound absorbing article of claim 31, wherein said flame-retardant agent is soluble in a liquid adhesive with which it is mixed, to form said coating.

35. The sound absorbing article of claim 31, wherein said flame-retardant agent forms between 10 % and 90 % by weight of said coating.  
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36. The sound absorbing article of claim 31, wherein said flame-retardant

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agent forms between 30 % and 70 % by weight of said coating.

37. The sound absorbing article of claim 1, wherein said coating increases said specific weight by a factor between 1.1 and 2.

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38. The sound absorbing article of claim 1, wherein said coating increases said specific weight by a factor between 2 and 3.

39. The sound absorbing article of claim 1, wherein said coating increases said specific weight by a factor between 3 and 4.

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40. The sound absorbing article of claim 1, wherein said coating increases said specific weight by a factor between 4 and 5.

41. The sound absorbing article of claim 1, wherein said coating increases said specific weight by a factor between 5 and 6.

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42. The sound absorbing article of claim 1, wherein said coating increases said specific weight by a factor between 6 and 7.

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43. The sound absorbing article of claim 1, wherein said coating increases said specific weight by a factor between 7 and 8.

44. The sound absorbing article of claim 1, wherein said coating increases said specific weight by a factor between 8 and 9.

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45. The sound absorbing article of claim 1, wherein said coating increases said specific weight by a factor between 9 and 10.

46. The sound absorbing article of claim 1, wherein said coating increases said specific weight by a factor between 10 and 15.

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47. The sound absorbing article of claim 1, wherein said coating increases said specific weight by a factor between 15 and 20.

5 48. The sound absorbing article of claim 1 and further including a membrane attached to said distal surface.

10 49. The sound absorbing article of claim 1 and further including a membrane attached to a first surface, selected from the group consisting of said proximal and distal surfaces.

15 50. The sound absorbing article of claim 49, wherein said membrane is selected from the group consisting of membranes which are impervious and semipervious to airflow.

51. The sound absorbing article of claim 49 wherein said membrane is impervious to airflow.

20 52. The sound absorbing article of claim 49, wherein said membrane is attached to said first surface only at selected bonding locations, forming channels between said membrane and said first surface.

25 53. The sound absorbing article of claim 52, wherein said channels are interconnected.

54. The sound absorbing article of claim 52, wherein said selected bonding locations are formed as bonding points, distributed on said first surface.

30 55. The sound absorbing article of claim 54, wherein said bonding points are evenly distributed on said first surface.

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56. The sound absorbing article of claim 55, wherein a distance between two of said bonding points is between 5 and 20 cm.

57. The sound absorbing article of claim 55, wherein a distance between  
5 two of said bonding points is between 2 and 5 cm.

58. The sound absorbing article of claim 55, wherein a distance between two of said bonding points is between 1 and 2 cm.

10 59. The sound absorbing article of claim 55, wherein a distance between two of said bonding points, is between 0.4 and 1 cm.

60. The sound absorbing article of claim 52, wherein said selected bonding locations are formed as bonding lines, distributed on said first surface.  
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61. The sound absorbing article of claim 60, wherein said bonding lines are evenly distributed on said first surface.

62. The sound absorbing article of claim 52, wherein said selected  
20 bonding locations are selected at random.

63. The sound absorbing article of claim 49, wherein said membrane is between 5 and 40  $\mu$  in thickness.

25 64. The sound absorbing article of claim 49, wherein said membrane is substantially 20  $\mu$  in thickness.

65. The sound absorbing article of claim 49 and further including a second membrane attached to a second surface, different from said first surface,  
30 selected from the group consisting of said proximal and distal surfaces.

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66. The sound absorbing article of claim 65, wherein said second membrane is selected from the group consisting of membranes, which are impervious and semipervious to airflow.

5 67. The sound absorbing article of claim 65, wherein said second membrane is semipervious to airflow.

68. The sound absorbing article of claim 65, wherein said second membrane is attached to said second surface only at selected bonding locations,  
10 forming second channels between said second surface and said membrane.

69. The sound absorbing article of claim 68, wherein said second channels are interconnected.

15 70. The sound absorbing article of claim 65, wherein said second membrane is between 5 and 40  $\mu$  in thickness.

71. The sound absorbing article of claim 49, and further including a rigid honeycomb arranged between said first surface and said membrane.  
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72. The sound absorbing article of claim 71, wherein said rigid honeycomb is formed of kraft paper.

73. The sound absorbing article of claim 72, wherein said kraft paper has  
25 a weight between 80 and 220  $\text{g/m}^2$ .

74. The sound absorbing article of claim 71, wherein said rigid honeycomb is formed of a polymer.

30 75. The sound absorbing article of claim 71, wherein said rigid honeycomb is between 0.5 and 6.0 cm in height.

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76. The sound absorbing article of claim 71, wherein said rigid honeycomb has an effective cell size between 0.5 and 3.0 cm.

5 77. A method of manufacturing a sound absorbing article, comprising:

(i) employing a material, which is pervious to air, and which is characterized by proximal and distal surfaces with respect to a sound source, an internal structure, and a specific weight; and

10 (ii) coating said material with a film which adheres to said surfaces and internal structure, thus increasing said specific weight by a predetermined factor.

78. The method of claim 77, wherein said coating further includes applying a flame retardant agent.

15 79. The method of claim 77 and further including attaching a membrane to a first surface selected from the group consisting of said proximal and distal surfaces.

20 80. The method of claim 79, wherein said membrane is impervious to airflow.

81. The method of claim 79, wherein said attaching further includes attaching only at selected bonding locations, thus forming channels between said membrane and said surface.

25 82. The method of claim 79, wherein said membrane is formed of polyethylene.

30 83. The method of claim 79, wherein said membrane is between 5 and 40  $\mu$  in thickness.

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84. The method of claim 79, wherein said membrane is between 15 and 25  $\mu$  in thickness.

85. The method of claim 79 and further including arranging a rigid  
5 honeycomb between said first surface and said membrane.

86. The method of claim 79 and further including attaching a second  
membrane to a second surface, different from said first surface, selected from the  
group consisting of said proximal and distal surfaces.

10 87. The method of claim 86, wherein said attaching further includes  
attaching only at selected bonding locations, thus forming second channels between  
said second surface and said membrane.

15 88. A sound absorbing article, comprising:

(i) a material which is pervious to air, and which is characterized by  
proximal and distal surfaces with respect to a sound source, an internal structure,  
and a specific weight; and

(ii) a membrane attached to a first surface, selected from the group  
20 consisting of said proximal and distal surfaces, at selected bonding locations,  
forming channels between said membrane and said first surface.

89. The sound absorbing article of claim 88, wherein said membrane is  
selected from the group consisting of membranes which are impervious and  
25 semipervious to airflow.

90. The sound absorbing article of claim 88, wherein said channels are  
interconnected.

30 91. The sound absorbing article of claim 88, wherein said material is a  
fibrous material.

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92. The sound absorbing article of claim 88, wherein said material is a foam.

5 93. The sound absorbing article of claim 88, wherein said membrane is formed of polyethylene.

10 94. The sound absorbing article of claim 88, wherein said membrane is between 5 and 40  $\mu$  in thickness.

95. The sound absorbing article of claim 88, wherein said membrane is substantially 20  $\mu$  in thickness.

15 96. The sound absorbing article of claim 88, wherein said selected bonding locations are formed as bonding points, distributed on said first surface.

97. The sound absorbing article of claim 88, wherein said selected bonding locations are formed as bonding lines, distributed on said first surface.

20 98. The sound absorbing article of claim 88, wherein said selected bonding locations are evenly distributed on said first surface.

25 99. The sound absorbing article of claim 88, wherein said selected bonding locations are selected at random.